


# BMJ Open Length of stay in long-term care facilities: a comparison of residents in six European countries. Results of the PACE cross-sectional study

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## ABSTRACT

**Objectives** This paper aims to investigate resident, facility and country characteristics associated with length of stay in long-term care facilities (LTCFs) across six European countries.

**Setting** Data from a cross-sectional study of deceased residents, conducted in LTCFs in Belgium, England, Finland, Italy, the Netherlands and Poland.

**Participants** All residents aged 65 years and older at admission who died in a 3-month period residing in a proportional random sample of LTCFs were included.

**Primary and secondary outcome measures** The primary outcome was length of stay in days, calculated from date of admission and date of death. Resident, facility and country characteristics were included in a proportional hazards model.

**Results** The proportion of deaths within 1 year of admission was 42% (range 32%–63%). Older age at admission (HR 1.04, 95% CI 1.03 to 1.06), being married/ in a civil partnership at time of death (HR 1.47, 95% CI 1.13 to 1.89), having cancer at time of death (HR 1.60, 95% CI 1.22 to 2.10) and admission from a hospital (HR 1.84, 95% CI 1.43 to 2.37) or another LTCF (HR 1.81, 95% CI 1.37 to 2.40) were associated with shorter lengths of stay across all countries. Being female (HR 0.72, 95% CI 0.57 to 0.90) was associated with longer lengths of stay.

**Conclusions** Length of stay varied significantly between countries. Factors prior to LTCF admission, in particular the availability of resources that allow an older adult to remain living in the community, appear to influence length of stay. Further research is needed to explore the availability of long-term care in the community prior to admission and its influence on the trajectories of LTCF residents in Europe.

## INTRODUCTION

As the population ages, the need for accessible, appropriate long-term care provision will become a global priority. Despite being reported as the least preferred place of death, older adults with dementia and multiple, complex conditions often die in long-term care facilities (LTCFs), although the proportion of deaths differs significantly between

## Strengths and limitations of this study

- The study sample included a large, representative sample of residents in long-term care facilities (LTCFs) across six European countries.
- The cohort of residents was identified retrospectively after death, meaning that there was no loss to follow-up at the end of the study.
- The study collected data on LTCF characteristics, including LTCF type and size.
- Health-related characteristics were measured either at death or in the last month/week of life, limiting the generalisability of the findings to resident characteristics at LTCF admission.
- The study was limited to data collected from LTCF staff members, increasing the likelihood of recall bias.

countries.<sup>1–5</sup> In England and Wales, LTCFs are projected to become the most common place of death for older adults by 2040.<sup>6</sup>

Previous reviews of studies containing community-based samples of older adults have identified numerous factors predictive of future LTCF admission, with older adults with dementia more likely to be admitted to an LTCF than those without.<sup>7–8</sup> Postadmission, the factors associated with shorter and longer length of stay in an LTCF have also been explored<sup>9–14</sup>; a systematic review of these factors identified shorter lengths of stay associated with older age, being male, having a cancer diagnosis, shortness of breath, receipt of oxygen therapy and residence in an LTCF providing nursing care.<sup>15</sup> In particular, the review found stronger evidence for the association of poor physical functioning and shorter lengths of stay, compared with cognitive functioning. The findings of the review were limited as no international studies using data comparable between countries were

identified and few studies included characteristics related to the facility or used data collected at time points post-admission. More recently, length of stay in nursing homes across seven countries has been examined using internationally comparable data from the Services and Health for Elderly in Long TERM care (SHELTER) study.<sup>16</sup> The sample was restricted to nursing homes, was neither randomly sampled nor representative of each country, and the findings were not reported between countries.<sup>17</sup>

In this analysis, we have used data from the Palliative Care for Older People in care and nursing homes in Europe (PACE) study, a retrospective, cross-sectional study of deaths in LTCFs, conducted in six European countries, which aimed to explore quality of dying and end-of-life care.<sup>18</sup> The PACE study collected data on nationally representative samples of deaths in multiple types of LTCFs, allowing comparison of length of stay between countries. This paper aims to compare length of stay between countries and to investigate the association of resident, facility and country level factors with length of stay from admission to death in LTCFs. In doing so, it will explore differences in the characteristics of LTCF residents with varying lengths of stay and identify heterogeneity in a relatively under researched population.

## METHODS

### Study design and setting

The PACE study undertook a retrospective, cross-sectional study of deaths in LTCFs in Belgium, England, Finland, Italy, the Netherlands and Poland. LTCFs were defined as a collective institutional setting where care is provided for older adult residents who reside there, 24 hours a day, 7 days a week, for an undefined period of time.<sup>19</sup> The care provided includes onsite provision of personal assistance with activities of daily living, nursing and medical care may be provided onsite or by nursing and medical professionals working from an organisation external to the setting.<sup>19</sup>

In each country, a proportional random sampling framework of LTCFs was developed using national lists of LTCFs. In Italy, no national list of LTCFs was available, therefore, a cluster of nursing homes interested in research was used.<sup>17</sup> In England, LTCFs were also recruited from Enabling Research in Care Homes, a network of LTCFs with an interest in research participation.<sup>20</sup> The methods used to recruit the LTCF and ethical approvals are discussed in the study protocol and primary outcomes publication.<sup>21 22</sup>

### Patient and public involvement

In each country, feedback on questionnaires for relatives was provided by three relatives recruited by the researchers. In England, a research partnership group including carers and volunteers provided feedback on questionnaires for relatives. Patient and public involvement is discussed in detail in the study protocol.<sup>21</sup>

### Study population

LTCFs that consented to take part in the study were asked to provide data on the facility and on all resident deaths in a retrospective period between 2015 and 2016. Residents were included in the study if they had died in the facility, or after transfer to hospital, in the past 3 months. For each identified resident, structured questionnaires were sent to the administrative staff (response rate 95.7%), facility manager (94.7%) and a staff member who knew the resident (81.6%). Questionnaires were also sent to the resident's physician and the resident's relative, however, data from these questionnaires are not used in this analysis.

### Independent variables

Factors identified in a systematic review as having strong, moderate or weak evidence of being related to length of stay were used to identify variables of interest collected in the PACE study.<sup>15</sup> The construction of each variable is detailed in table 1.

Demographic data were collected on resident age, gender, marital status and source of admission. Data on diagnoses of cancer, severe pulmonary disease or severe diabetes were collected, as was the presence of pressure ulcers or history of a stroke. Shortness of breath, oxygen therapy, assistance with eating or drinking and enteral, parenteral or artificial administration of nutrition during the last week of life were also recorded. Severity of dementia was calculated using a combined score from the Global Dementia Scale (GDS)<sup>23</sup> and Cognitive Performance Scale (CPS).<sup>24</sup>

The general health of the resident during the last week of life was documented using a scale of 0–100, with 0 representing worst health possible and 100 representing the best health possible. Physical functioning was determined using two validated questionnaires, the Bedford Alzheimer Nursing-Severity Scale (BANS-S)<sup>25</sup> and the EuroQol 5 dimensional (EQ-5D).<sup>26</sup> The BANS-S collected data on seven items; ability to dress oneself, sleep cycle, speech, eating, mobility, muscle flexibility and eye contact in the last month of life. The EQ-5D measured quality of life in the last week of life, including anxiety or depression, mobility, self-care, usual activities and pain in the last week of life.

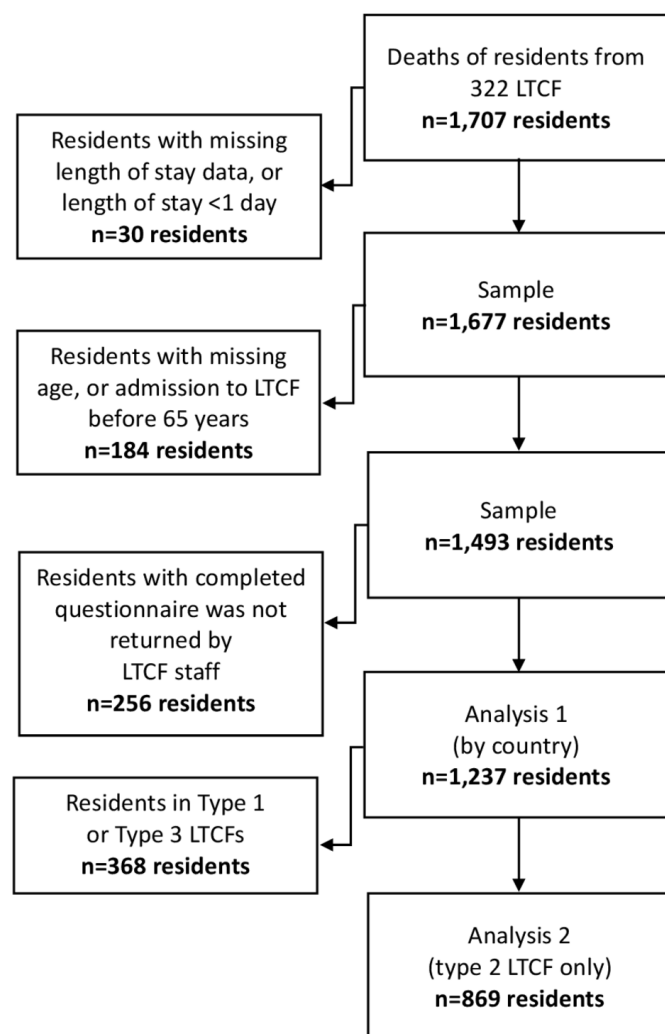
Contact with health services were measured by the number of visits either received or made by a physician, visits to a hospital and admissions to an emergency department. Place of death was determined as the facility, hospice or palliative care unit, or a hospital.

Using the typology developed by Froggatt *et al*, LTCFs were categorised by the type of care offered.<sup>27</sup> These were: type 1; a facility where onsite care is provided by physicians, nurses and care assistants (present in Italy, Netherlands, Poland); type 2; a facility where onsite care is provided by nurses and care assistants with medical provision provided by local, external primary care services (present in all countries); type 3; a facility where onsite care is provided by care assistants, and nursing with medical provision provided by local, external primary care

**Table 1** Definition of variables used in the analysis

Variable name	Variable definition
Age	Resident age at the time of admission.
Gender	Resident gender at the time of admission.
Marital status	Marital status at the time of death, grouped into married/in civil partnership or in long-term relationship, or other (divorced, widowed, never married).
Source of admission	Source of admission to the LTCF, grouped into three categories, community, hospital or another LTCF.
Cancer	Diagnosis based on the question 'which of the following conditions was the resident suffering from at the time of death?'
Severe pulmonary disease	
Severe diabetes	
Pressure ulcers	Whether the resident had decubitus during the last week of life.
Stroke	Whether the resident suffered a stroke in the last month of life.
Shortness of breath	Whether the resident experienced shortness of breath during the last week of life, classed as not at all, somewhat or a lot.
Oxygen therapy	Whether the resident received oxygen therapy in the last week of life.
Assistance with eating or drinking	Whether the resident received assistance with eating or drinking in the last week of life.
Enteral, parenteral or artificial administration of nutrition	Whether the resident received enteral, parenteral or artificial administration of nutrition in the last week of life.
Severity of dementia	Very severe or advanced dementia was classed as a GDS score of 7 and a CPS score of 5 or 6. Severe dementia was classed as a GDS score less than 7 and a CPS score of 5 or 6, or a GDS score of seven and a CPS score of less than 5. Mild or moderate dementia was classed as a GDS score less than 7 and a CPS score of less than 5.
General health	The general health of the resident during the last week of life, documented using a scale of 0 to 100, with 0 representing worst health possible and 100 representing the best health possible.
Physical functioning	Scores for each BANS-S item ranged from one to four, with one indicating ability and four indicating dependency, which were grouped into no or mild impairments (scores 1–2) versus moderate to severe impairments (scores 3–4).  Scores for each EQ-5D item ranged from 0 to 5, with 0 indicating no problems or independence and 5 indicating severe problems or total dependence. These were grouped into no or mild impairments (scores 1–3) versus moderate to severe impairments (scores 4–5).
Physician visits	The no of visits either received or made by a physician during the last month of life.
Hospital visits	The no of visits to a hospital, geriatric ward, intensive care unit or general ward (for more than 24 hours) during the last month of life.
Emergency department admissions	The no of admissions to a hospital emergency room (for less than 24 hours) during the last month of life.
Place of death	Place of death was determined as the facility, a hospice or palliative care unit, or a hospital; including a general ward, intensive care unit or accident and emergency department.
LTCF type	Each LTCF was categorised by the type of care offered. Type 1; a facility where onsite care is provided by physicians, nurses and care assistants (present in Italy, Netherlands, Poland); type 2: a facility where onsite care is provided by nurses and care assistants with medical provision provided by local, external primary care services (present in all countries); type 3: a facility where onsite care is provided by care assistants, and nursing with medical provision provided by local, external primary care services (present in England).
LTCF funding status	The funding status of the LTCF was either public (non-profit), private (non-profit) or private (for profit).
LTCF size	The size of the facility was classed as either small or large, based on average bed number in each country sample.

BANS-S, Bedford Alzheimer Nursing-Severity Scale; CPS, Cognitive Performance Scale; EQ-5D, EuroQol 5 dimensional; GDS, Global Dementia Scale; LTCF, long-term care facility.



**Figure 1** Recruitment to the PACE study and development of the dataset. LTCF, long-term care facility; PACE, Palliative Care for Older People in care and nursing homes in Europe.

services (present in England). The funding status of the LTCF was either public (non-profit), private non-profit or private for profit. The size of the facility was classed as either small or large, based on average bed number in each country sample.

### Dependent variable

Date of admission and date of death were used to calculate length of stay in days in the facility.

### Data analysis

First, analysis was conducted by country on all LTCFs within the country sample, with LTCF type included as a factor if more than one type was present in the country. Second, analysis was restricted to residents in type 2 LTCFs, providing onsite nursing care and external medical provision, which are present in all six countries, allowing for comparison of similar LTCF types between countries.

The initial dataset contained data on 1707 participants, as detailed in figure 1. Participants were excluded if length of stay could not be calculated or was less than 1 day, if

residents were younger than 65 years on admission, were missing data on age, or no questionnaire was returned by LTCF staff (n=470), resulting in a final sample of 1237 participants. Analysis of LTCFs providing onsite nursing care only was conducted on 869 participants.

Univariate analysis of the variables was performed and significance tested using log rank tests and Kaplan-Meier curves were plotted for each factor. All factors associated with the outcome at a  $p \leq 0.2$  at univariate analysis were entered into a proportional hazards model, including testing for potential interactions between age, gender and marital status. HRs, 95% CIs and p values that reached a statistical significance of  $p \leq 0.05$  or  $p \leq 0.01$  are reported. An HR above 1 indicates a greater risk of death, or a shorter length of stay, and an HR of less than 1 indicates a lower risk of death or a longer length of stay. Multicollinearity was checked using variance inflation factors. Proportionality assumptions were tested by exploring time-dependant covariates and Schoenfeld residuals; and goodness of fit was tested using Cox-Snell residuals. A variable to identify each individual LTCF was added as a random, multilevel effect to account for multiple residents within the same LTCF. The final model used was a parametric proportional hazards model using a Weibull distribution. All analyses were performed using v16 Stata.<sup>28</sup>

### RESULTS

The characteristics of the sample are described in table 2. The non-response analysis did not identify significant differences in the lengths of stay of residents for whom a staff questionnaire was or was not completed and returned ( $p=0.356$ ). The median length of stay was 73.4 weeks, ranging from 16 weeks in Poland to 103.9 weeks in Belgium. Average length of stay was 126 weeks (SD 157), ranging from 93 (SD 156) weeks in Poland to 163 (SD 182) weeks in Belgium. The number of deaths within 1 year of admission was 521 (42%), ranging from 85 (32%) in Belgium to 165 (63%) in Poland. The mean age of residents at admission was 83.9 years (SD 7.2), ranging from 82.1 (SD 7.8) in Poland to 85.7 (SD 7.4) in England. The percentage of residents who were female was 67%, ranging from 64% in Belgium to 77% in England.

### Analysis of all LTCFs by country

Table 3 shows the results of the proportional hazards model for each of the six countries, results that reached a statistical significance of  $p \leq 0.05$  or  $p \leq 0.01$  are indicated.

In Belgium, older age at admission (HR 1.05, 95% CI 1.02 to 1.08), being married/in a civil partnership (HR 2.65, 95% CI 1.68 to 4.16) and admission from hospital (HR 2.62, 95% CI 1.80 to 3.81) or another LTCF (HR 2.14, 95% CI 1.25 to 3.67) were associated with shorter lengths of stay. Moderate or severe mobility problems (HR 0.34, 95% CI 0.14 to 0.86) were associated with longer lengths of stay.



**Table 2** Characteristics of deceased LTCF residents all six countries

	Belgium n=262	England n=75	Finland n=252	Italy n=192	Netherlands n=193	Poland n=263	Overall n=1237	P value
No of LTCFs (average number of residents/range)	46 (6/1–17)	37 (2/1–7)	88 (3/1–11)	32 (6/1–27)	42 (5/1–32)	46 (6/1–24)	288 (4/1–32)	
Average length of stay—mean/SD (weeks)	163/182	147/153	119/140	102/136	146/153	93/156	126/157	≤0.01
Length of stay—median	103.9	101	83	61.4	101.4	16	73.4	
Deaths within 1 year of admission	85 (32)	27 (36)	93 (37)	87 (45)	64 (33)	165 (63)	521 (42)	
Age at admission								
Mean/SD (years)	84.6/6.5	85.7/7.4	83.9/7.2	84.2/7.4	84.4/6.8	82.1/7.8	83.9/7.2	≤0.01
65–74 years	22 (8)	6 (8)	26 (10)	22 (11)	19 (10)	51 (19)	146 (12)	≤0.01
75–84 years	93 (37)	23 (31)	107 (42)	67 (35)	72 (37)	107 (41)	469 (38)	
85–94 years	136 (52)	41 (55)	107 (42)	90 (47)	94 (49)	96 (37)	564 (46)	
94 years and over	11 (4)	5 (7)	12 (5)	13 (7)	8 (4)	9 (3)	58 (5)	
Gender—female	168 (64)	58 (77)	163 (65)	131 (68)	131 (68)	180 (68)	831 (67)	0.43
Marital status—married or in a civil partnership	61 (23)	14 (19)	58 (23)	47 (24)	50 (26)	30 (11)	260 (21)	≤0.01
Source of admission								≤0.01
Community	96 (37)	39 (52)	75 (30)	92 (48)	94 (49)	136 (52)	532 (43)	
Hospital	81 (31)	18 (24)	86 (34)	59 (31)	28 (15)	93 (35)	365 (30)	
Other LTCF	30 (12)	16 (21)	68 (27)	31 (16)	32 (17)	25 (10)	202 (16)	
Place of death								≤0.01
LTCF	214 (82)	62 (83)	213 (85)	165 (86)	172 (89)	214 (81)	1040 (84)	
Hospice/PCU	1 (0)	0 (0)	23 (9)	0 (0)	11 (5)	48 (18)	83 (7)	
Hospital	47 (18)	12 (16)	2 (1)	23 (12)	6 (3)	1 (0)	91 (7)	
Cancer	36 (14)	14 (19)	36 (14)	36 (19)	34 (18)	25 (10)	181 (15)	0.08
Severe pulmonary disease	40 (15)	8 (11)	20 (8)	30 (16)	27 (14)	35 (13)	160 (13)	0.13
Severe diabetes	20 (8)	2 (3)	23 (9)	27 (14)	12 (6)	30 (11)	114 (9)	0.02
Stroke	24 (9)	6 (8)	12 (5)	25 (13)	9 (5)	42 (16)	118 (10)	≤0.01
Pressure ulcers	49 (19)	7 (9)	44 (17)	72 (38)	33 (18)	91 (35)	296 (24)	≤0.01
General health—mean/SD†	31.7/24.2	33.2/22.9	24.4/21.8	20.1/19.9	29.2/21	26.9/25.1	27.1/23	≤0.01
Dementia								≤0.01
Resident did not have dementia	92 (35)	25 (33)	40 (16)	41 (21)	74 (38)	66 (25)	338 (27)	
Mild or moderate dementia	24 (9)	11 (15)	43 (17)	14 (7)	28 (15)	14 (5)	134 (11)	
Severe dementia	45 (17)	10 (13)	54 (21)	39 (20)	34 (18)	32 (12)	214 (17)	
Very severe or advanced dementia	77 (29)	17 (23)	71 (28)	64 (33)	52 (27)	93 (35)	374 (30)	

Continued

Table 2 Continued

	Belgium	England	Finland	Italy	Netherlands	Poland	Overall	P value
	n=262	n=75	n=252	n=192	n=193	n=263	n=1237	
Assistance with eating or drinking	190 (73)	49 (65)	197 (78)	159 (83)	140 (73)	225 (86)	960 (78)	≤0.01
Enteral, parenteral or artificial administration of nutrition	15 (6)	5 (7)	19 (8)	81 (42)	6 (3)	142 (54)	268 (22)	≤0.01
Shortness of breath								≤0.01
Not at all	120 (46)	43 (57)	83 (33)	86 (45)	90 (47)	72 (27)	494 (40)	
Somewhat	90 (34)	21 (28)	111 (44)	64 (33)	56 (29)	131 (50)	473 (38)	
A lot	39 (15)	8 (11)	44 (17)	30 (16)	43 (22)	44 (17)	208 (17)	
Oxygen therapy	57 (22)	7 (9)	57 (23)	120 (63)	24 (12)	94 (36)	359 (29)	≤0.01
EQ-5D (moderate or severe problems)								
Anxiety or depression	103 (39)	21 (28)	84 (33)	103 (54)	92 (48)	135 (51)	538 (43)	≤0.01
Mobility	237 (90)	70 (93)	237 (94)	182 (95)	174 (90)	250 (95)	1150 (93)	0.01
Self-care	245 (94)	71 (95)	241 (96)	183 (95)	175 (91)	250 (95)	1165 (94)	≤0.01
Usual activities	243 (93)	67 (89)	241 (96)	187 (97)	177 (92)	253 (96)	1168 (94)	≤0.01
Pain	130 (50)	31 (41)	167 (66)	99 (52)	124 (64)	179 (68)	730 (59)	≤0.01
BANS-S (moderate or severe impairment)								
Dressing	231 (88)	68 (91)	235 (93)	185 (96)	164 (85)	232 (88)	1115 (90)	≤0.01
Sleeping	94 (36)	18 (24)	101 (40)	91 (47)	54 (28)	161 (61)	519 (42)	≤0.01
Speech	129 (49)	24 (32)	131 (52)	130 (68)	69 (36)	178 (68)	661 (53)	≤0.01
Eating	144 (55)	43 (57)	176 (70)	163 (85)	104 (54)	210 (80)	840 (68)	≤0.01
Mobility	200 (76)	59 (79)	207 (82)	178 (93)	139 (72)	229 (87)	1012 (82)	≤0.01
Muscle flexibility	123 (47)	29 (39)	189 (75)	142 (74)	104 (54)	197 (75)	784 (63)	≤0.01
Eye contact	71 (27)	13 (17)	55 (22)	79 (41)	35 (18)	108 (41)	361 (29)	≤0.01
Physician visits								≤0.01
None	4 (2)	5 (7)	35 (14)	44 (23)	3 (2)	28 (11)	119 (10)	
One to four visits	75 (29)	47 (63)	116 (46)	40 (21)	62 (32)	56 (21)	396 (32)	
Five or more	49 (19)	15 (20)	54 (21)	34 (18)	101 (52)	97 (37)	350 (28)	
Hospital visits								≤0.01
None	188 (72)	56 (75)	192 (76)	164 (85)	157 (81)	170 (65)	927 (75)	
One or more	62 (24)	19 (25)	53 (21)	19 (10)	31 (16)	49 (19)	233 (19)	
Emergency department admissions								0.02
None	218 (83)	58 (77)	206 (82)	149 (78)	170 (88)	209 (79)	1010 (82)	
One or more	31 (12)	14 (19)	39 (15)	29 (15)	17 (9)	19 (7)	149 (12)	

Continued

Table 2 Continued

	Belgium	England	Finland	Italy	Netherlands	Poland	Overall	P value
	n=262	n=75	n=252	n=192	n=193	n=263	n=1237	
LTCF type								≤0.01
Type 1—onsite nursing/onsite GP	0 (0)	0 (0)	0 (0)	46 (24)	105 (54)	165 (63)	316 (26)	
Type 2—onsite nursing/offsite GP	262 (100)	39 (52)	252 (100)	135 (70)	83 (43)	98 (37)	869 (70)	
Type 3—offsite nursing/offsite GP	0 (0)	36 (48)	0 (0)	0 (0)	0 (0)	0 (0)	36 (3)	
LTCF funding status								≤0.01
Public—non-profit	128 (49)	2 (3)	197 (78)	65 (34)	188 (97)	165 (63)	745 (60)	
Private—non profit	117 (45)	9 (12)	24 (10)	44 (23)	0 (0)	92 (35)	286 (23)	
Private—profit	17 (6)	64 (85)	28 (11)	72 (38)	0 (0)	4 (2)	185 (15)	
LTCF size								0.93
Small	138 (53)	40 (53)	131 (52)	96 (50)	107 (55)	137 (52)	649 (52)	
Large	124 (47)	35 (47)	121 (48)	85 (44)	81 (42)	126 (48)	572 (46)	

Unless otherwise stated data is reported as frequencies and percentages.

\*Higher scores indicate better general health. Missing data: gender n=8, marital status n=90, source of admission n=138, place of death n=23, cancer n=55, severe pulmonary disease n=55, severe diabetes n=55, stroke n=127, pressure ulcers n=32, dementia n=177, assistance with eating or drinking n=43, shortness of breath n=62, oxygen therapy n=44, EQ-5D: anxiety or depression n=43, mobility n=25, self-care n=26, usual activities n=24, pain n=31, BANS-S: dressing n=26, sleeping n=33, speech n=30, eating n=26, mobility n=26, muscle flexibility n=32, eye contact n=27. Physician visits n=372, hospital visits n=77, emergency department admissions n=78, LTCF type n=16, LTCF ownership n=21, LTCF size n=16. P values calculated using Pearson  $\chi^2$  two and one-way ANOVAs.

ANOVA, analysis of variance; BANS-S, Bedford Alzheimer Nursing-Severity Scale; EQ-5D, EuroQol 5 dimensional; GP, general practitioner; LTCF, long-term care facility; PCU, palliative care unit.

**Table 3** Multilevel proportional hazard model—factors associated with length of stay within each country

	Belgium			England			Finland			Italy			Netherlands			Poland		
	HR	95% CI		HR	95% CI		HR	95% CI		HR	95% CI		HR	95% CI		HR	95% CI	
Age at admission	1.05**	1.02 to 1.08		1.09**	1.02 to 1.16		1	0.95 to 1.05		1.04**	1.01 to 1.07		1.04*	1 to 1.08		1.07*	1.03 to 1.12	
Gender—female	0.7	0.48 to 1.02		0.12**	0.04 to 0.37		0.69	0.95 to 1.05		0.75	0.48 to 1.17		0.64	0.39 to 1.05		0.42*	0.21 to 0.86	
Married/civil partnership#female							6.45*	1.21 to 34.23										
Marital status—married or in a civil partnership	2.65**	1.68 to 4.16					1.01	0.27 to 3.7		1.2	0.73 to 1.96		1.55	0.92 to 2.6		1.93	0.8 to 4.65	
Source of admission—community (ref)																		
Hospital	2.62**	1.8 to 3.81		2.03	0.74 to 5.59		1.83	0.7 to 4.83					2.58**	1.31 to 5.08		7.04**	3.11 to 15.94	
Other LTCF	2.14**	1.25 to 3.67		1.94	0.74 to 5.06		2.27	0.82 to 6.31					2.73**	1.37 to 5.44		0.72	0.28 to 1.86	
Place of death—LTCF (ref)																		
Hospice/PCU													1.24	0.49 to 3.16		1.06	0.42 to 2.68	
Hospital	1.02	0.57 to 1.8											58.66**	4.9 to 702.44				
Cancer				1.1	0.49 to 2.46		1.74	0.52 to 5.86		1.85*	1.12 to 3.06							
Severe pulmonary disease	1.05	0.62 to 1.76					1.79	0.51 to 6.29		0.94	0.57 to 1.54					0.84	0.36 to 1.94	
Severe diabetes							0.92	0.29 to 2.85										
Stroke							1.64	0.32 to 8.4								1.05	0.35 to 3.12	
Pressure ulcers							1.25	0.48 to 3.22								1.21	0.59 to 2.47	
General health	0.97	0.78 to 1.21		1.38	0.85 to 2.22		0.7	0.4 to 1.23		1.08	0.83 to 1.39		0.91	0.67 to 1.23		1.42	0.93 to 2.15	
Dementia—resident did not have dementia (ref)																		
Mild or moderate dementia				0.23**	0.08 to 0.68		1.64	0.55 to 4.91		0.58	0.28 to 1.21		2.03	0.99 to 4.14		0.59	0.13 to 2.55	
Severe dementia				0.56	0.19 to 1.65		0.72	0.21 to 2.55		0.56*	0.32 to 0.99		1.37	0.75 to 2.49		0.44	0.16 to 1.23	
Very severe or advanced dementia				0.15**	0.06 to 0.37		1.14	0.37 to 3.52		0.69	0.4 to 1.17		1.56	0.86 to 2.81		0.63	0.27 to 1.46	
EQ-5D (moderate or severe problems)																		
Anxiety or depression	1.27	0.86 to 1.88					0.77	0.38 to 1.58					1.18	0.74 to 1.86		1.24	0.67 to 2.28	
Mobility	0.34*	0.14 to 0.86		19.95*	1.62 to 245.72		0.37	0.04 to 3.72								0.06*	0 to 0.83	
Self-care	0.99	0.23 to 4.26		0.57	0.05 to 6.62											2.37	0.19 to 29.46	
Usual activities	1.11	0.32 to 3.82																
Pain	1.14	0.77 to 1.67					1.51	0.69 to 3.28								0.83	0.4 to 1.69	
BANS-S (moderate or severe impairment)																		
Dressing	1.43	0.67 to 3.04					0.12**	0.02 to 0.74		0.32*	0.12 to 0.9							
Speech	0.91	0.62 to 1.33					0.54	0.24 to 1.21										
Eating		to					1.43	0.45 to 4.5								0.66	0.2 to 2.25	
Mobility	0.75	0.45 to 1.27					0.63	0.24 to 1.69					0.98	0.59 to 1.64		2.36	0.28 to 19.81	
Eye contact																2.17*	1.19 to 3.96	

Continued



**Table 3** Continued

	Belgium		England		Finland		Italy		Netherlands		Poland	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Artificial feeding	0.91	0.42 to 1.96	0.86	0.07 to 10.85	1.46	0.36 to 5.99	0.87	0.58 to 1.3	3.36	0.9 to 12.6		
Assistance with eating or drinking	0.83	0.54 to 1.28	1.03	0.45 to 2.33			0.53*	0.3 to 0.92				
Shortness of breath—not at all (ref)												
Somewhat			0.15**	0.05 to 0.46							0.72	0.32 to 1.61
A lot			0.84	0.19 to 3.78							0.55	0.18 to 1.66
Oxygen therapy			9.69*	1.55 to 60.61	0.76	0.28 to 2.08					2.06	0.89 to 4.79
Physician visits—none (ref)												
One to four visits					2.14	0.88 to 5.17					1.48	0.44 to 4.98
Five or more					3.15	0.92 to 10.84					0.99	0.4 to 2.46
Hospital visits—none (ref)												
One or more	1.25	0.8 to 1.94			0.89	0.3 to 2.67			1.63	0.76 to 3.52	2.18*	1.01 to 4.72
Emergency department admissions—none (ref)												
One or more					1.45	0.55 to 3.82						
LTCF type—type 2—onsite nursing/offsiteGP (ref)												
Type 1—onsite nursing/onsite GP	NA		NA		NA				0.87	0.46 to 1.65	4.05**	1.43 to 11.44
Type 3—offsite nursing/offsite GP	NA		0.11**	0.04 to 0.31	NA		NA		NA		NA	
LTCF funding status—public—non-profit (ref)												
Private—non-profit	1.22	0.85 to 1.77									0.22**	0.1 to 0.49
Private—profit	1.88	0.88 to 4.01										
LTCF size—small (ref)												
Large											0.81	0.39 to 1.68

All factors associated with the outcome at a p value of 0.2 at univariate analysis were entered into the multivariate model.

\*P<0.05 \*\*P<0.01.

BANS-S, Bedford Alzheimer Nursing-Severity Scale; EQ-5D, EuroQol 5 dimensional; GP, general practitioner; LTCF, long-term care facility; NA, not applicable; PCU, palliative care unit.

In England, older age at admission (HR 1.09, 95% CI 1.02 to 1.16), moderate or severe mobility problems (HR 19.95, 95% CI 1.62 to 245.72) and receipt of oxygen therapy (HR 9.69, 95% CI 1.55 to 60.61) were associated with shorter lengths of stay. Being female (HR 0.12, 95% CI 0.04 to 0.37), moderate or mild dementia (HR 0.23, 95% CI 0.08 to 0.68), very severe or advanced dementia (HR 0.15, 95% CI 0.06 to 0.37), being somewhat short of breath (HR 0.15, 95% CI 0.05 to 0.46) and residing in a type 3 LTCF (HR 0.11, 95% CI 0.04 to 0.31) were associated with longer lengths of stay.

In Finland, the interactions between gender and being married/in a civil partnership (HR 6.45, 95% CI 1.21 to 34.23) were associated with shorter lengths of stay. Moderate or severe impairment in ability to dress oneself (HR 0.12, 95% CI 0.02 to 0.74) was associated with longer lengths of stay.

In Italy, older age at admission (HR 1.04, 95% CI 1.01 to 1.07) and having a cancer diagnosis (HR 1.85, 95% CI 1.12 to 3.06) were associated with shorter lengths of stay. Severe dementia (HR 0.56, 95% CI 0.32 to 0.99), moderate or severe impairment in ability to dress oneself (HR 0.32, 95% CI 0.12 to 0.90) and assistance with eating or drinking (HR 0.53, 95% CI 0.30 to 0.92) were associated with longer lengths of stay.

In Netherlands, older age at admission (HR 1.04, 95% CI 1.00 to 1.08), dying in hospital (HR 58.66, 95% CI 4.90 to 702.44) and admission from hospital (HR 2.58, 95% CI 1.31 to 5.08) or another LTCF (HR 2.73, 95% CI 1.37 to 5.44) were associated with shorter lengths of stay.

In Poland, older age at admission (HR 1.07, 95% CI 1.03 to 1.12), admission from hospital (HR 7.04, 95% CI 3.11 to 15.94), one or more hospital visits (HR 2.18, 95% CI 1.01 to 4.72), moderate or severe eye contact impairment (HR 2.17, 95% CI 1.19 to 3.96) and residing in a type 1 facility (HR 4.05, 95% CI 1.43 to 11.44) were associated with shorter lengths of stay. Being female (HR 0.42, 95% CI 0.21 to 0.86), moderate or severe mobility problems (HR 0.06, 95% CI 0.00 to 0.83) and residing in a not for profit facility (HR 0.22, 95% CI 0.10 to 0.49) were associated with longer lengths of stay.

### Analysis of type 2 LTCFs across countries

Table 4 shows the results of the proportional hazards model for type 2 LTCFs across the six countries. Older age at admission (HR 1.04, 95% CI 1.03 to 1.06), being married/in a civil partnership (HR 1.47, 95% CI 1.13 to 1.89), admission from a hospital (HR 1.84, 95% CI 1.43 to 2.37) or another LTCF (HR 1.81, 95% CI 1.37 to 2.40), having a cancer diagnosis (HR 1.60, 95% CI 1.22 to 2.10) and residing in Italy (HR 1.93, 95% CI 1.25 to 3.00), Poland (HR 1.94, 95% CI 1.27 to 2.96), England (HR 2.18, 95% CI 1.21 to 3.93) or Finland (1.42, 95% CI 1.02 to 1.96) compared with Belgium were associated with shorter lengths of stay. Being female (HR 0.72, 95% CI 0.57 to 0.90) was associated with longer lengths of stay.

**Table 4** Multilevel proportional hazards model—factors associated with length of stay in type 2 LTCFs across all six countries

	HR	95% CI
Age at admission	1.04**	1.03 to 1.06
Being female	0.72**	0.57 to 0.90
Being married/in a civil partnership	1.47**	1.13 to 1.89
Source of admission—community (ref)		
Hospital	1.84**	1.43 to 2.37
Other LTCF	1.81**	1.37 to 2.40
Place of death—LTCF (ref)		
Hospice/PCU	1.15	0.75 to 1.78
Hospital	1.30	0.81 to 2.07
General health	0.95	0.84 to 1.08
Cancer	1.60**	1.22 to 2.10
Severe pulmonary disease	1.19	0.89 to 1.61
EQ-5D (moderate or severe problems)		
Anxiety or depression	1.10	0.87 to 1.37
Pain	0.93	0.74 to 1.18
Mobility	1.03	0.77 to 1.37
BANS-S (moderate or severe impairment)		
Speech	0.97	0.76 to 1.25
Dementia—resident did not have dementia (ref)		
Mild or moderate dementia	0.87	0.62 to 1.22
Severe dementia	0.85	0.63 to 1.14
Very severe or advanced dementia	0.78	0.57 to 1.05
Oxygen therapy	1.09	0.85 to 1.40
Hospital visits—none (ref)		
One or more	1.29	0.97 to 1.72
Emergency department admissions—none (ref)		
One or more	0.94	0.66 to 1.33
LTCF funding status—public—non-profit (ref)		
Private—non-profit	1.28	0.95 to 1.74
Private—profit	1.10	0.74 to 1.65
Country—Belgium (ref)		
Finland	1.42*	1.02 to 1.96
Italy	1.93**	1.25 to 3.00
Netherlands	1.24	0.83 to 1.84
Poland	1.94**	1.27 to 2.96
England	2.18**	1.21 to 3.93

All factors associated with the outcome at a p value of 0.2 at univariate analysis were entered into the multivariate model.

\*P<0.05 \*\*P<0.01.

BANS-S, Bedford Alzheimer Nursing-Severity Scale; EQ-5D, EuroQol 5 dimensional; LTCF, long-term care facility; PCU, palliative care unit.

## DISCUSSION

### Summary of findings

In this study, we have examined the association between resident, facility and country-level factors with length of stay in an LTCF. The results show a large variation in length of stay between residents in the same country and between countries. The analysis identified four factors that are consistently statistically significant across all six countries and between countries; older age at admission, being admitted from a hospital or another LTCF, being married/in a civil partnership and being female.

### Strengths and limitations

This is the first study that the research team are aware of that compared length of stay until death in multiple types of LTCFs internationally. The data were collected across six European countries, using a standardised collection method within a representative, random, relatively large sample of LTCFs. It would be difficult to achieve a similar dataset in scope and size by combining nationally collected routine data, if such data were available. Previous epidemiological studies of different types of LTCFs have been restricted to nursing homes as one particular type of LTCF or facilities from one organisation<sup>17 29 30</sup> potentially limiting the wider applicability of findings.

The main limitation of this analysis that the PACE study was developed to compare the outcomes, quality and costs of palliative and end-of-life care between countries.<sup>22</sup> Consequently, much of the data collected were related to either the last month or week of life. Although the data were not collected to explore length of stay in LTCFs, they do allow for such an analysis. The majority of previous research in this area were prospective studies collecting data on explanatory variables at baseline and outcome data on death within a prespecified follow-up period.<sup>10–14</sup> In both approaches, changes in the resident's well-being during residence in the LTCF are potentially missed; however, this analysis is novel in its use of data collected at end of life rather than on LTCF admission. Future research would benefit from collecting data at multiple time points from LTCF admission to death to further explore how changes in resident health are associated with length of stay.

The use of retrospective data is a common approach in palliative care research, with the last 3-month of life commonly used.<sup>31–35</sup> The data used in this analysis were reported by LTCF staff, rather than retrieved from medical records, increasing the likelihood of measurement error and recall bias.

### Interpretation of findings

The findings indicate that length of stay in an LTCF is associated with pre-existing factors prior to admission. All four characteristics indicate that length of stay in an LTCF is influenced by factors prior to admission, in particular the availability of resources that allow an older adult to remain living in the community. Older adults with care

needs in the community commonly receive care from spouses, where available.<sup>36</sup> As women generally live longer than men, it is possible that partnerless older women are living in LTCFs longer than older, married men, due to lack of a spousal carer. The findings in Finland indicate that being married reduces the length of stay in women, however, this was not replicated in other countries. In addition to being more likely to enter an LTCF,<sup>37</sup> this study indicates that partnerless, older women are also likely to live in an LTCF for longer.

Admission to an LTCF often follows a period of hospitalisation or other enhanced care, where return to living in the community is no longer possible.<sup>38</sup> In areas where integrated services for older people are well developed, emergency admission to a hospital is lower,<sup>39</sup> supporting the idea that while older adults are remaining in the community for as long as possible before LTCF admission, their care needs may not necessarily be being met.

The relationship between physical functioning, cognitive functioning and length of stay is less clear. In two countries, mobility problems were associated with longer lengths of stay, however, in England mobility problems were related to shorter lengths of stay. The relationship between poor mobility and longer lengths of stay could reflect a deterioration from admission to death; on admission, a resident may have few problems with mobility, subsequently declining over time, reflecting poor mobility before death in longer stay residents. It is less clear why residents with better mobility before death would have shorter lengths of stays. One diagnosis, cancer, was associated with shorter lengths of stay in the between country analysis, possibly reflecting the relatively fast period of decline experienced in this condition.<sup>40</sup>

Dementia was related to longer lengths of stay in Italy and England. Although a diagnosis of dementia has been identified as the strongest predictor of care home admission,<sup>8</sup> in this study, it has not been associated with shorter lengths of stay. The differences found here could be explained by the availability of other services; in England and Italy, it may be more difficult to live independently in the community with dementia; therefore, older adults may be admitted to an LTCF earlier, leading to a longer length of stay. Neither physical nor cognitive functioning was associated with shorter lengths of stay in the between country analysis, indicating that factors prior to admission have a greater influence on length of stay.

The findings also provide some evidence to indicate that older adults use services which provide the minimum available care to meet their needs. In Poland and England, shorter lengths of stay were significantly associated with the highest level of care available (type 1 and type 2, respectively). A possible explanation for this could be that admission criteria for facilities providing higher levels of care require residents to have greater health needs, resulting in shorter lengths of stay before death. Further research is needed to explore how the availability of different types of LTCF provision is utilised by the older adult population. In future, research

conducting international comparisons in this area may benefit from comparing countries with similar long-term care provision.

## CONCLUSION

Older adults residing in LTCFs are a diverse population with multiple, often complex, healthcare needs. This study has highlighted the need for further research on the trajectories of older adults admitted to LTCFs, and their length of stay. In particular, further attention should be given to ensuring groups likely to have longer lengths of stay, namely partnerless older women, receive appropriate long-term care or other options to remain living in the community are available.

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